

**PRIORITIES FOR THE INTEGRATED DEVELOPMENT OF SOIL
MICROMORPHOLOGY AND SOIL ZOOLOGY: RESULTS OF A BRAINSTORMING
SESSION**

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During a two-hour workshop, 50 soil micromorphologists and soil zoologists participated in an exercise designed to identify priorities for the integrated development of their disciplines.

Several months before this workshop, a list of 20 needs of soil zoologists, identified by us, was circulated to other speakers as background materials to the workshop. This list was also included in the registration package given to all symposium participants. These topics have been integrated into the full list of identified needs given below (those not mentioned during the workshop have an asterisk).

The participants were divided into 10 groups of five, each group including representatives of both disciplines. Two five minute exercises were then conducted during which participants brainstormed (listed, uncritically, as many things as they could think of in the time available) on the questions "in what ways can members of the other discipline benefit your discipline" and "in what ways can members of your discipline help the other discipline". One member from each group recorded responses, and all responses were then listed on flip charts and posted in view of all participants.

Groups were then encouraged to expand their initial lists by imagining that there were no restraints on their proposals and that ideal conditions prevailed. Finally, each group was asked to identify, taking into account their previous suggestions, the three most important needs to achieve the integrated development of the disciplines. These priority needs were combined and then arranged under the following six headings. The more extensive list of suggestions, referred to earlier, is given in an Appendix using the same headings.

PRIORITY NEEDS

1. Policy

- Identify changes in government policies that will facilitate the integrated development of soil micromorphology and soil zoology.
- Identify ways to translate research findings into improved soil management practices.
- Improve public education (use of media, *etc.*) concerning the importance of these disciplines.
- Increase the number of university positions in these disciplines.
- Establish multidisciplinary "Soil Institutes" (building, for example, on the experiences of Dr. Josef Rusek, Director of the Laboratory of Soil Biology, Institute of Landscape Ecology, Czechoslovakia).

2. Research

- Facilitate and support multidisciplinary research (from planning to publication).
- Improve international planning and cooperation of research programs (building on International Biological Program experience).

3. Education

- Establish educational programs that integrate these disciplines, at least at the University level.
- Provide general and specialized short courses (and field trips), covering the various aspects of these disciplines.

4. Networking

- Produce a directory of specialists noting their fields of interest and current projects.
- Continue to hold joint symposia for these (and other related) disciplines.

5. Literature

- Produce low cost, high quality textbooks providing syntheses of what is known and unknown in these disciplines.
- Prepare illustrated, comprehensive, easy-to-use keys and atlases of soils and soil organisms.

6. Techniques

- Develop reliable, standardized, inexpensive and easy-to-use techniques for conducting research in these disciplines.

APPENDIX: FULL LIST OF NEEDS IDENTIFIED DURING WORKSHOP

1. Policy

- Dissolve disciplines (at least at the edges).
- Shift emphasis to long-term multidisciplinary studies.
- Identify potential sources of institutional support.

- Promote institutional support.
- Improve public education (better use of media *etc.*).
- Establish chairs in soil biology/soil micromorphology.
- Establish "Soil Institutes" integrating these and other related disciplines.
- Facilitate interaction between members of these disciplines in universities, institutes, *etc.*.

4. Networking

- Establish a common journal.
- Produce a directory of specialists noting their fields of interest and current projects (including willingness to identify and describe soils and soil fauna).
- Establish data banks with minimum access costs.
- Continue to hold joint symposia for these (and other related) disciplines, including workshops and think-tanks *e.g.*, to continue the initiative described in this paper.
- * Prepare directories of special facilities and equipment that are not widely available.

2. Research

A. Requests from soil micromorphologists to soil zoologists:

- Clarify relationships between soil community and soil type.
- Identify and provide information concerning the distribution (horizontal and vertical) of soil animals, exuviae and faeces.
- Clarify the ecological importance and influence on physical factors of different species/genera/orders of soil animals, *e.g.*, their role in decomposition of organic matter.
- Provide qualitative and quantitative data concerning the feeding habits of different soil animals.
- Describe the niche characteristics of different soil animals.
- Collaborate in research projects (from planning to publication) and establish multidisciplinary research teams.
- Consider the needs of soil micromorphologists when selecting soil zoology research topics.
- Provide physico-chemico-biological descriptions of faeces of different soil animals.
- Describe the major 'types' of soil communities.

B. Requests from soil zoologists to soil micromorphologists:

- Describe the major chemical transformations in soil.
- Describe the micromorphology of different soils, including identification of potential food sources, mineral and humus composition, pore spaces, *etc.*
- Describe the micromorphology of the stages in humification.
- Collaborate in research on "problem soil profiles".
- Collaborate in research on the acceleration of soil-forming processes.
- Describe the impact of salinization on soil structure and function.

6. Techniques

- Develop non-destructive research techniques (*e.g.*, sampling).
- Develop reliable, standardized, inexpensive and easy-to-use research techniques.
- Develop improved methods for embedding, staining, making thin sections and analyzing soil (*e.g.*, discover a water miscible, non-toxic embedding resin).
- * Prepare "Cookbooks" of techniques (including hints not usually given in textbooks).
- * Prepare a "Consumer guide" to equipment (giving advantages and disadvantages).
- * Prepare a "Cookbook" of statistical techniques and a list of computer and micro computer program packages that are especially useful for soil fauna and soil micromorphology research.

3. Education

- Emphasize to soil scientists the living reality of soil.
- Share information "at the microscope" (soil fauna/faeces identification, ped description, *etc.*)
- Organize joint field trips.
- Provide general and specialized short courses (including laboratory experience and field trips) covering the various aspects of these disciplines (for professionals and non-professionals).
- Guide students enrolled in each of the disciplines to attend one or more courses in the other discipline.
- * Produce learning packages, tapes, films, slide sets, video-tapes, modules *etc.*, on all aspects of these and related disciplines, and prepare guides to existing materials.

5. Literature

- Prepare guides (annotated bibliographies, *etc.*) to the basic literature.
- Prepare illustrated, comprehensive, easy-to-use keys to adult and immature soil animals (by habitat, region, feeding group, *etc.*).
- Produce low-cost, high quality textbooks.
- Prepare basic comprehensive atlases of soil micromorphology (including three dimensional views of pore spaces).
- * Prepare thesauri of soil zoology and soil micromorphology.
- * Prepare comprehensive dictionaries of soil zoology and soil micromorphology.
- * Produce directories of translations of relevant books and papers.
- * Produce directories of grants, with tips on grantsmanship.